



WESTERN PROCESSING REMEDIAL ACTION SITE
PRELIMINARY GEOPHYSICAL SURVEY REPORT
AREA I SOUTH (NORTH SEGMENT)

NORTEC Job No. 280-004

Prepared for:
HDR INFRASTRUCTURE
Seattle, Washington

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NORTHERN TECHNICAL SERVICES

SEATTLE, WASHINGTON

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1.0 INTRODUCTION

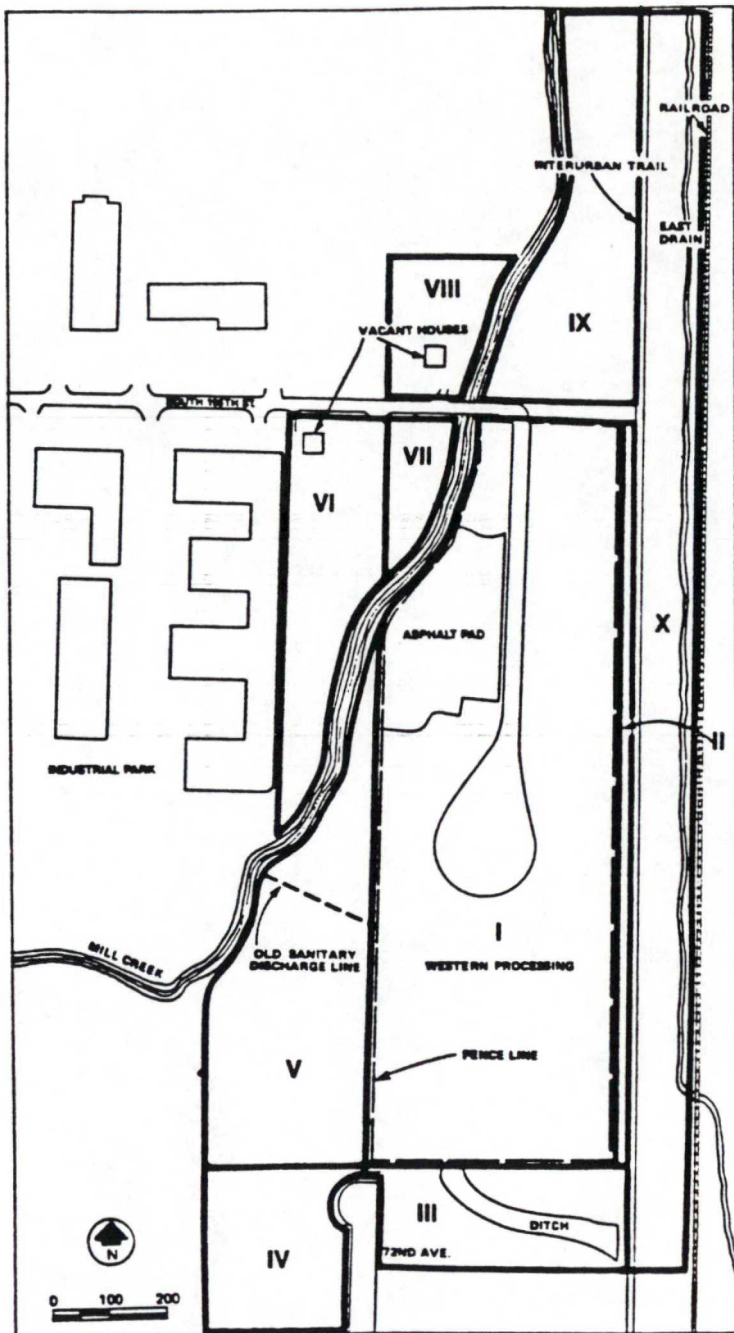
1.1 General

On August 18, 1986 a contract was awarded by the Sampling and Test Plan Contracting GROUP to perform a systematic study of shallow soil contamination at the Western Processing Superfund Site in Kent, Washington. The study was designed to determine the precise nature and extent of hazardous chemical contamination and to provide a basis for certain remedial cleanup activities. In general, the study includes: 1) preparation of a detailed study plan which was approved by the GROUP and governmental agencies, 2) the conduct of field investigations, including a geophysical survey, and 3) preparation of a final report describing the investigative procedures and presenting the data developed. This document provides the preliminary results of geophysical survey on a southern portion of the site.

1.2 Background

The Western Processing Superfund Site is located at 7215 S. 196th Street in Kent, Washington. The facility was operated as an industrial waste processing and recycling facility from 1961 to 1983. During its history of operation the facility handled, processed and/or recycled animal byproducts, brewers yeast, and a wide variety of industrial waste products, including solvents, flue dust, battery chips, acids and cyanide solutions.

The site is officially defined as the Western Processing Property (Figure 1, Areas I and VII) and Off-Property Remedial Action Areas (Figure 1, Areas II-V and VIII-X). The Western Processing Property occupies approximately 12.3 acres. An operations trailer, mobile water treatment plant, several enclosed storage vans, one plastic-lined impoundment, and several areas covered with asphalt paving and concrete slabs are presently located on the property. Mill Creek traverses the northwest corner of the property. The Kent Bicycle Trail occupies a former railroad right-of-way to the east of Area I. A petroleum product pipeline, three high-voltage powerlines, and a drainage ditch also parallel the eastern boundary. Further to the east is the active Burlington Northern Railroad line. Area V which lies adjacent to the west fence, south of Mill creek is littered with large vehicles and stacks of heavy construction materials.



REMEDIAL ACTION AREAS

LANDAU ASSOCIATES, INC.

FIGURE 1

1.3 Study Objectives

The overall study objectives are to evaluate the precise nature and extent of contaminated materials to be removed from Area I and disposed of offsite and to assist in determining the extent of certain planned remedial actions in Areas II-V and VII-X. More specifically the objectives of the geophysical survey are to:

- Locate buried drums, tanks, utilities, and process lines within Area I, and
- Determine the locations of all abandoned or active utilities, process lines, or other pipes leaving Area I and crossing into or ending in Areas II-V and VII-X.

2.0 TECHNICAL APPROACH

2.1 General

NORTEC is responsible for conducting a geophysical field investigation program and preparing reports presenting the geophysical survey results.

The geophysical program in progress for Area I includes a total field and gradient magnetic survey, an EM conductivity survey, and a ground penetrating radar (GPR) survey.

In order to facilitate an efficient and time effective soil sampling program, Area I was initially divided into two distinct survey segments: a north segment and a south segment (Figure 2). Due to unforeseen delays created by a required health and safety upgrade, Area I south was further divided in half in an attempt to keep the soils sampling program on schedule. As a result, geophysical survey was first performed in the south segment of Area I South (see Figure 2). The results of this survey were presented in a report on 8 November 1986. This report provides the preliminary results of geophysical survey in the north segment of Area I South. At the time of these surveys, access to adjacent properties was not available and data from these areas is not included in this report.

2.2 Horizontal Control of the Survey Grid

An initial survey grid based on 75 foot centers was established within the survey area by HDR. Using this grid, NORTEC developed the final 10 foot center grid for the geophysical survey with chaining, staking and flagging techniques.

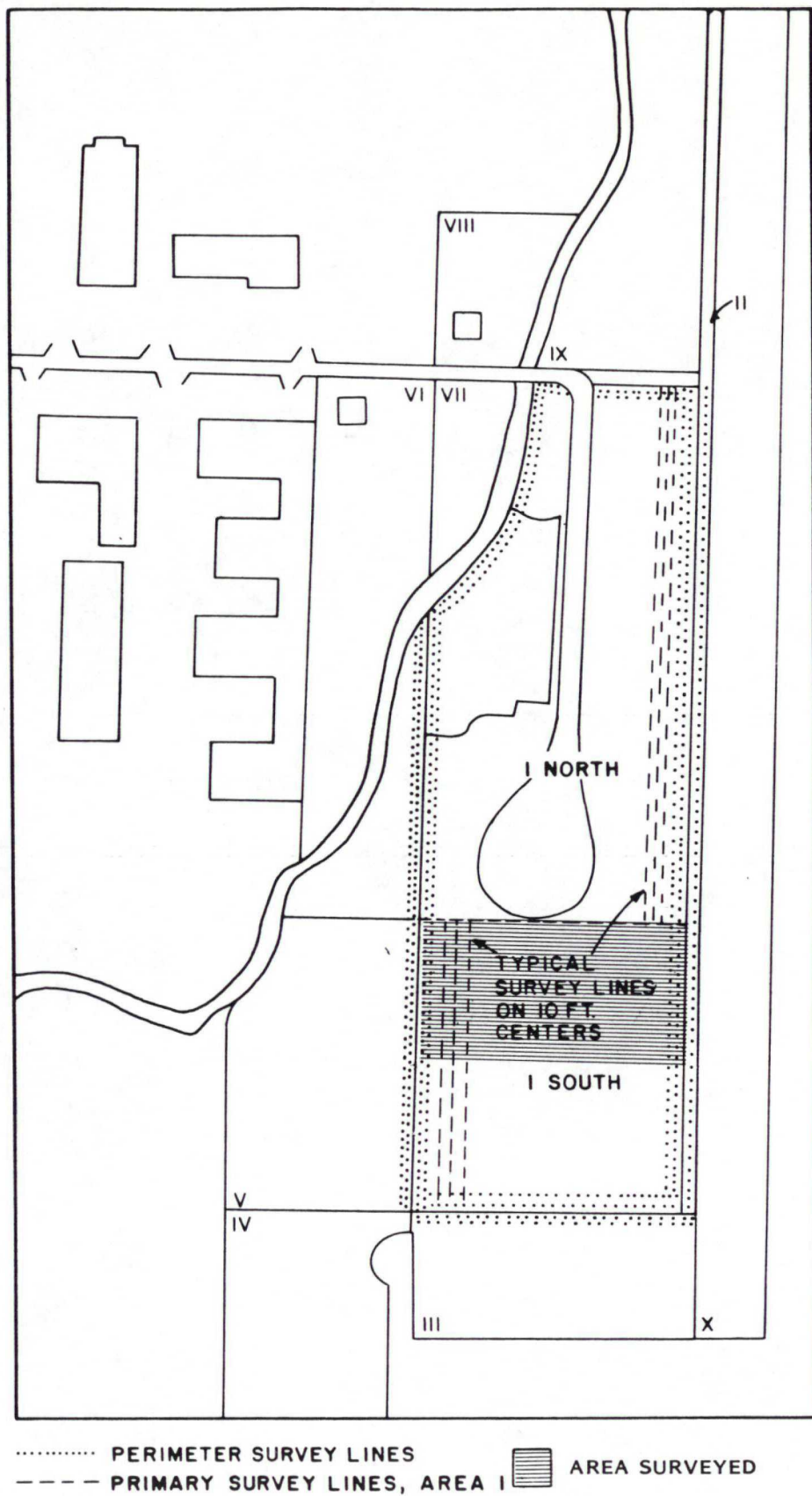


FIGURE 2. GEOPHYSICAL SURVEY AREA.

2.3 Geophysical Systems

The geophysical methods used to accomplish the goals of this study are: a magnetometer survey, including both total field and vertical gradient; a shallow depth electromagnetic (EM) survey; and a ground penetrating radar (GPR) survey. Systems deployed include: an EDA Omni IV survey magnetometer with digital tape recorder and a base station magnetometer; a GEONICS EM-31 with digital recorder; and a GSSI 120 MHz GPR with an analog tape recorder.

All geophysical systems were operated in the field according to established Technical Procedures Documents for each instrument.

The magnetometer and EM survey was performed on a north-south grid on 10 foot centers. Additional GPR survey was utilized for the purpose of refining and extending the EM and magnetic survey results.

2.4 Data Analysis and Interpretation

The magnetometer data was corrected for diurnal variations and contoured in Total Magnetic Field (TMF) and Vertical Gradient format for analysis and interpretation. TMF measurements allow mapping of local variations in the earth's magnetic field due to the nearby presence of ferrous materials. Vertical Gradient measurements provide information representative of the differences in the local gradient of the earth's magnetic field created by nearby ferrous materials. Gradient data is often used to define the locations of magnetic anomalies generally expressed on the TMF presentation. TMF data is expressed in gammas while Vertical Gradient data is expressed in gammas/meter.

The EM-31 data was processed and contoured to reflect both the quadrature and the inphase components. The quadrature component or terrain conductivity is presented in millimhos/meter. Terrain conductivity data is useful for mapping conductive or metallic targets and for characterizing the general conductivity or resistivity of the shallow soils or groundwater of the area. With the exception of large buried metallic objects, in most cases the conductivity of the pore fluids dominates the measurement. The inphase component data provides a sensitive indication of the presence of metals.

The Ground Penetrating Radar (GPR) data is presented on facsimile paper in the form of a cross-sectional geophysical profile of the shallow soils along a given trackline. Several characteristic subsurface radar signatures or geophysical units were identified throughout the north segment of survey site I-South.

The geophysical interpretation of these characteristic radar signatures was based upon the general principals of seismic facies analysis. Parameters which were considered in identifying

the different subsurface geophysical features were: 1) reflection amplitude, 2) reflection continuity, 3) reflection configuration, 4) dominant reflection frequency, 5) geometry of the geophysical unit, 6) presence of diffractions, and 7) areal associations.

Identification of anomalous or natural subsurface conditions was based on the geophysical parameters of the data collected with the GPR, EM-31, and magnetometer, and by reference to historical written or aerial photo documentations identifying past land use activity on the site.

3.0 SURVEY RESULTS

3.1 General

The results of the analysis of the EM-31, the magnetometer, and the Ground Penetrating Radar surveys are summarized in Table 1 and presented in Plates 1 and 2.

3.2 Anomalous Subsurface Target Areas

15 anomalous regions were identified based on the geophysical data. These regions are identified in Table 1 and Plate 1 as Anomalies 17 through 31. Table 1 provides a general description of the geophysical character of the anomaly (i.e., EM, Magnetometer or Radar anomaly), a brief narrative of the nature of the anomalous region and an estimate of the possible nature of the anomaly.

Within many of the identified anomalous regions, specific subregions or target sites have been identified and listed in Table 1 and illustrated on Plate 1. In addition, specific subsurface radar targets identified on the radargrams are plotted directly on the Anomaly Map (Plate 1). Since the entire site was not covered with Ground Penetrating Radar, the absence of radar target designations in certain areas does not indicate that the area was surveyed and found to be void of targets. Anomalies of interest include:

ANOMALY 18 may represent two separate features, an old military drainfield and a gun emplacement or missile silo. This area appeared quite complex and contained Magnetometer, EM and Ground Penetrating Radar anomalies.

ANOMALY 19 is a significant WNW-ESE trending anomaly which is suggested to be a utility or waste process line corridor. The anomaly appears to branch near the eastern fence and may exit the site in this area. Geophysical evidence is less conclusive near the western border of the site and the corridor may exit the site in this area or join the suspected military drainfield in Anomaly 18. Several regions of anomalously high terrain conductivity are noted adjacent to the suspected corridor suggesting that it may

have been used to transfer conductive effluent which may have leaked into the surrounding shallow soils. This corridor-like feature may have been associated with the fertilizer plant.

ANOMALY 21 & 23 were detected within an area which was used as a small subsurface impoundment and which appeared to contain storage tanks. These anomalies may represent remnants of the storage tank system or debris or ferrous materials (possible drums) which were buried in the impoundment when it was filled.

ANOMALY 24 indicates the presence of buried metallic materials in an area which once contained a small subsurface impoundment. The metallic targets may be debris or other materials (possibly drums) which were buried in the impoundment when it was filled.

ANOMALY 29 is located on the western edge of a documented subsurface impoundment site. The various ferrous targets and radar targets detected in this region may represent debris and other materials (possibly drums) buried when the impoundment was filled. A general EM field disturbance in this area indicates a high conductivity/low resistivity condition in the shallow soils of a part of this area (Plate 2).

3.3 Anomalous Soil Conductivity Regions

A summary of the terrain conductivity for the survey area is presented in Plate 2. Areas of anomalously high or low soils conductivity conditions have been outlined.

Areas of anomalous, highly conductive soils occupy a northeastern to northcentral area, a south central area and north-south trending band in the western part of the map (Plate 2). Conductivity values range from 100 to greater than 200 millimhos/meter. The northern high conductivity area may be associated with a corridor-like feature or waste transfer line. The north-south trending band of high conductivity soils in the western area of the map ties to high conductivity soils anomalies to the south and north, and the south central anomaly appears as an isolated feature which may be associated with residual materials in a filled subsurface impoundment documented in that area.

An area of anomalous low terrain conductivity was detected on the western boundary of the map. Conductivity values ranged from 50 to less than 10 millimhos/meter in this area. The nature of this EM field disturbance is unknown but may be associated with an old military waste drainfield suspected to occupy this area.

4.0 DISCLAIMER

Geophysical surveys performed as a part of this project may not successfully detect any or all subsurface objects or features present. Locations and depths of buried objects or subsurface features mapped as a result of this survey are the result of geophysical interpretations only, and should be considered as confirmed, actual, or accurate only where recovered by excavation or drilling.

TABLE 1

GEOFYSICAL ANOMALIES
WESTERN PROCESSING REMEDIAL ACTION SITE

AREA I SOUTH (NORTH SEGMENT)
2+50 West to 6+50 West; 5+50 North to 8+50 North

ANOMALY NUMBER	GEOFYSICAL CHARACTER				COMMENTS
	MAG	EM	QUAD	RADAR INPHASE	
17	X	X		X	MAGNETOMETER ANOMALY AND EM FIELD DISTURBANCE. BURIED FERROUS MATERIALS INDICATED POSSIBLY DEBRIS FROM SMALL STRUCTURE REPORTED ON SITE BETWEEN 1956 & 1983
17A	X				MAGNETOMETER ANOMALY, PRIMARY TARGET; BURIED FERROUS MATERIAL INDICATED.
17B			X		AREA OF EM FIELD DISTURBANCE BURIED METALLIC MATERIALS SUGGESTED.
17C			X		AREA OF EM FIELD DISTURBANCE BURIED METALLIC MATERIALS SUGGESTED.
18	X	X	X	X	AREA OF MAGNETIC ANOMALIES AND EM FIELD DISTURBANCES. POSSIBLY TWO SEPARATE FEATURES: A DRAINFIELD & A MILITARY GUN EMPLACEMENT, OR MISSILE SILO.
18A			X	X	AREA OF EM FIELD DISTURBANCE. NUMEROUS SUBSURFACE RADAR TARGETS, POSSIBLY PIPES. MILITARY BASE WASTE SUMP & DRAINFIELD SUGGESTED. FEATURE MAY DRAIN OFFSITE TO THE WEST
18B	X	X	X	X	SUBREGION OF MAGNETOMETER AND EM ANOMALIES. BURIED METALLIC TARGETS INDICATED. MAGNETIC SIGNATURE SUGGESTS VERTICAL STRUCTURE TO DEPTH. POSSIBLY REINFORCED CONCRETE COLUMN. MILITARY GUN EMPLACEMENT, MISSILE SILO, OR DRAINFIELD SUMP SUGGESTED.
18C	X				MAGNETOMETER ANOMALY; PRIMARY TARGET AREA. BURIED FERROUS MATERIALS INDICATED.
18D	X				MAGNETOMETER ANOMALY; PRIMARY

ANOMALY GEOPHYSICAL CHARACTER
NUMBER MAG EM RADAR
QUAD INPHASE

COMMENTS

ANOMALY NUMBER	MAG	EM	RADAR	COMMENTS
18E	X	X		TARGET AREA. BURIED FERROUS MATERIALS INDICATED. EM ANOMALY, PRIMARY TARGET AREA. BURIED METALLIC MATERIALS INDICATED. MAY BE SUMP FOR DRAIN FIELD TO THE WEST.
19	X	X	X	ANOMALOUS EM AND RADAR REGION. POSSIBLY UTILITY OR WASTE PROCESS LINE CORRIDOR. MAY EXIT THE SITE ON BOTH THE EAST AND WEST BORDERS. NO FERROUS MATERIAL INDICATED. MAY HAVE BEEN INSTALLED FOR THE FERTILIZER PLANT. MAY BRANCH NEAR THE EASTERN SITE BOUNDARY.
19A		X		AREA OF EM FIELD DISTURBANCE. BURIED METALLIC MATERIAL INDICATED.
19B		X		AREA OF EM FIELD DISTURBANCE SECONDARY TARGET AREA BURIED METALLIC MATERIAL INDICATED.
19C		X		AREA OF EM FIELD DISTURBANCE SECONDARY TARGET AREA BURIED METALLIC MATERIAL INDICATED.
19D		X		AREA OF EM FIELD DISTURBANCE SECONDARY TARGET AREA, BURIED METALLIC MATERIAL INDICATED.
19E		X		AREA OF EM FIELD DISTURBANCE SECONDARY TARGET AREA, BURIED METALLIC MATERIAL INDICATED. POSSIBLY BURIED DEBRIS FROM SMALL STRUCTURE REPORTED ONSITE BETWEEN 1956 & 1983.
20		X		EM FIELD DISTURBANCE OF UNKNOWN NATURE. BURIED METALLIC MATERIALS INDICATED SECONDARY TARGET AREA.
21	X		X	MAGNETOMETER ANOMALY & SUBSURFACE RADAR TARGET

ANOMALY GEOPHYSICAL CHARACTER
 NUMBER MAG EM RADAR
 QUAD INPHASE

COMMENTS

=====

DETECTED. PRIMARY TARGET
 AREA. BURIED FERROUS MATERIAL
 INDICATED. POSSIBLY REMNANTS
 OF STORAGE TANKS PRESENT ON
 SITE NEAR THIS LOCATION OR
 DEBRIS LEFT IN SUBSURFACE
 IMPOUNDMENT NOTED IN THIS
 AREA IN 1976.

 22 X MAGNETOMETER ANOMALY;
 SUBSURFACE RADAR TARGET
 DETECTED, PRIMARY TARGET
 AREA. BURIED FERROUS MATERIAL
 INDICATED. POSSIBLY REMNANTS
 OF STORAGE TANKS NOTED ONSITE
 NEAR THIS LOCATION OR DEBRIS
 LEFT IN SUBSURFACE
 IMPOUNDMENTS DOCUMENTED NEAR
 THIS AREA IN 1976.

 23 X X X MAGNETOMETER AND EM ANOMALY.
 BURIED FERROUS MATERIALS
 INDICATED. SUBSURFACE RADAR
 TARGETS DETECTED. POSSIBLY
 REMNANTS OF STORAGE TANKS
 DOCUMENTED NEAR THIS AREA.

23A X MAGNETOMETER ANOMALY
 BURIED FERROUS MATERIALS
 INDICATED. NATURE UNKNOWN.
 23B X X EM FIELD DISTURBANCE AND RADAR
 TARGET. BURIED METALLIC
 MATERIAL INDICATED, NATURE
 UNKNOWN.

 24 X X X ANOMALOUS EM AND MAGNETOMETER
 REGION. BURIED METALLIC
 MATERIALS INDICATED. POSSIBLY
 DEBRIS LEFT IN SUBSURFACE
 IMPOUNDMENTS DOCUMENTED IN
 THIS AREA IN 1974 & 1978.

24A X MAGNETOMETER ANOMALY; PRIMARY
 TARGET AREA. BURIED FERROUS
 MATERIAL INDICATED.

24B X AREA OF EM FIELD DISTURBANCE
 NATURE UNKNOWN.

24C X EM ANOMALY. BURIED METALLIC
 MATERIALS INDICATED. NATURE

ANOMALY GEOPHYSICAL CHARACTER
 NUMBER MAG EM RADAR
 QUAD INPHASE

COMMENTS

=====			
UNKNOWN.			
25	X		
			MAGNETOMETER ANOMALY. BURIED FERROUS MATERIAL INDICATED. NATURE UNKNOWN.
26		X	
			AREA OF EM FIELD DISTURBANCE, NATURE UNKNOWN.
27		X	X
			AREA OF EM FIELD DISTURBANCE. BURIED SUBSURFACE RADAR TARGET DETECTED. BURIED METALLIC MATERIAL INDICATED.
28		X	
			AREA OF EM FIELD DISTURBANCE. SECONDARY TARGET AREA. BURIED METALLIC MATERIAL SUGGESTED.
29	X		X
			AREA OF MAGNETOMETER AND SUBSURFACE RADAR ANOMALIES . BURIED FERROUS MATERIALS INDICATED. PERHAPS DEBRIS (POSSIBLY DRUMS) DISPOSED OF IN A SUBSURFACE IMPOUNDMENT DOCUMENTED IN 1966 NEAR THIS SITE.
29A	X		X
			MAGNETOMETER ANOMALY. SUBSURFACE RADAR TARGET DETECTED. PRIMARY TARGET AREA NATURE UNKNOWN.
29B	X		X
			MAGNETOMETER ANOMALY. SUB-SURFACE RADAR TARGET DETECTED BURIED FERROUS MATERIAL INDICATED NATURE UNKNOWN.
29C	X		
			MAGNETOMETER ANOMALY. PRIMARY TARGET AREA. BURIED FERROUS MATERIAL INDICATED. NATURE UNKNOWN.
30	X		
			MAGNETOMETER ANOMALY. PRIMARY TARGET AREA. BURIED FERROUS MATERIAL INDICATED. POSSIBLY REMNANT OF STRUCTURE DOCUMENTED NEAR THIS SITE BETWEEN 1965 & 1983.
31	X		X
			ANOMALOUS MAGNETOMETER AND EM AREA. SUBSURFACE RADAR

ANOMALY GEOPHYSICAL CHARACTER
 NUMBER MAG EM RADAR
 QUAD INPHASE

COMMENTS

=====

31A	X		TARGET DETECTED. BURIED FERROUS MATERIAL INDICATED. NATURE UNKNOWN. POSSIBLY REMNANT OF MILITARY GUN EMPLACEMENT.
			MAGNETIC ANOMALY; PRIMARY TARGET AREA. BURIED FERROUS MATERIAL INDICATED.
31B		X	AREA OF EM FIELD DISTURBANCE. NATURE UNKNOWN. BURIED METALLIC MATERIALS INDICATED.
31C		X	AREA OF EM FIELD DISTURBANCE. SECONDARY TARGET AREA. NATURE UNKNOWN. BURIED METALLIC MATERIALS INDICATED.
31D		X	AREA OF EM FIELD DISTURBANCE. SECONDARY TARGET AREA. NATURE UNKNOWN. BURIED METALLIC MATERIALS INDICATED.

PLATE 1

Geophysical Anomaly Map

TARGET SHEET

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Site File:

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☐ DVD

☐ USB Drive

☐ Hard Drive

☐ Floppy Disk

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☐ Cassette*

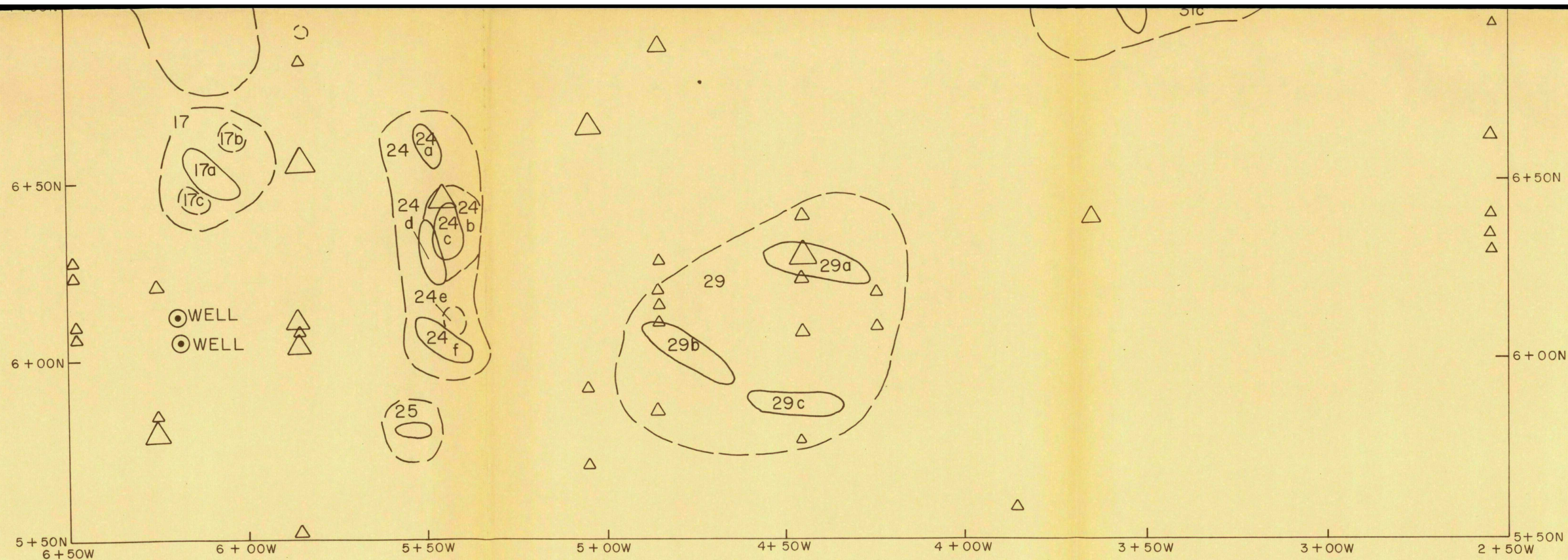
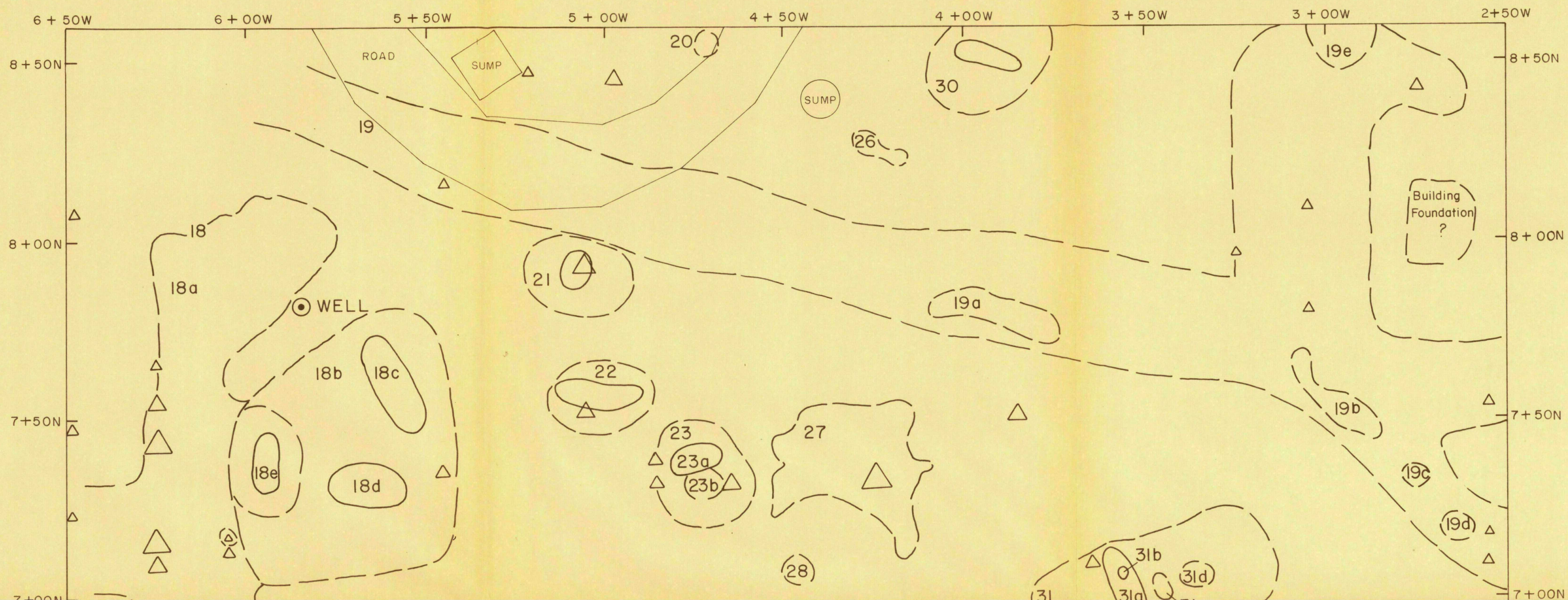
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1 of 2.

*Please contact the Superfund Records Center to access this information.



Region 10
1200 Sixth Ave.
Seattle, WA 98101



WESTERN PROCESSING REMEDIAL ACTION SITE,
KENT WASHINGTON
PRELIMINARY GEOPHYSICS ANOMALY MAP
AREA 1 SOUTH (PARTIAL)
PREPARED FOR: HDR INFRASTRUCTURE
PREPARED BY: NORTHERN TECHNICAL SERVICES
PLATE 1 of 2

△△△△ DISCRETE RADAR TARGET
● WELL
--- ANOMALOUS REGION
○ PRIMARY TARGET AREA

50 0 50
FEET

PLATE 2

Terrain Conductivity Map

TARGET SHEET

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Site File:

Folder:

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☐ CD

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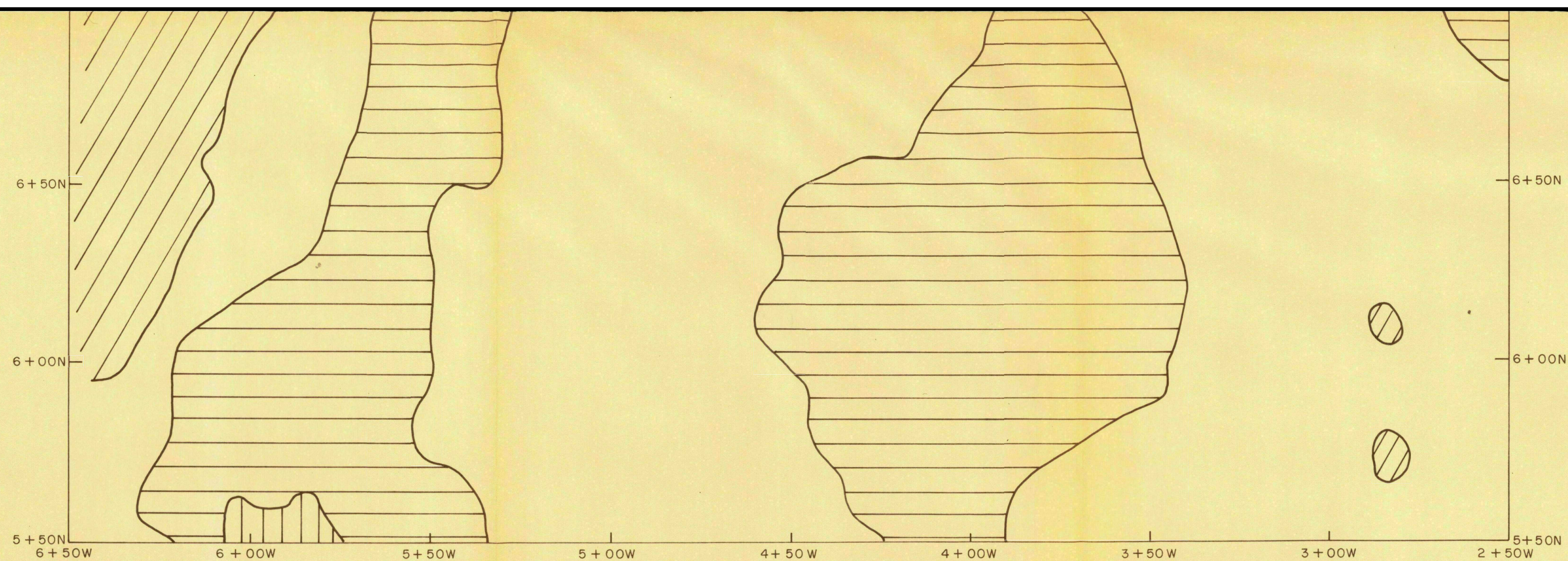
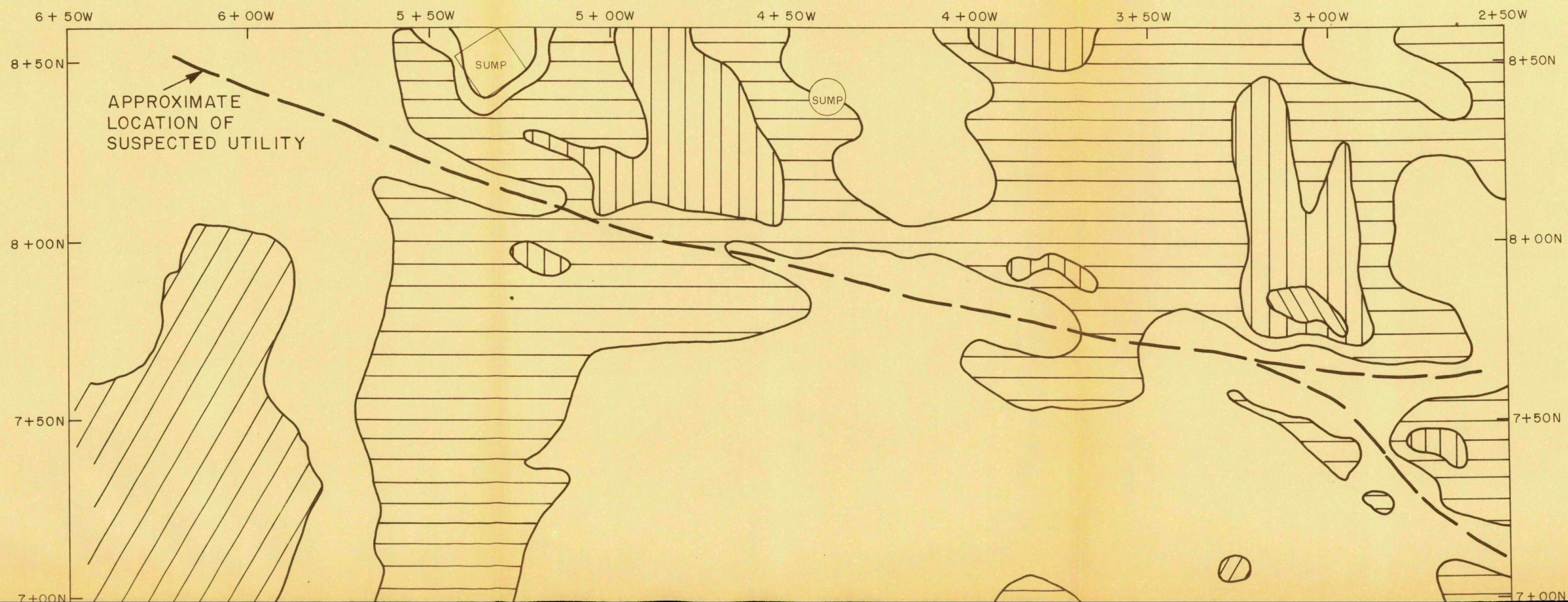
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2 of 2.

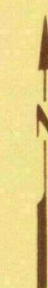
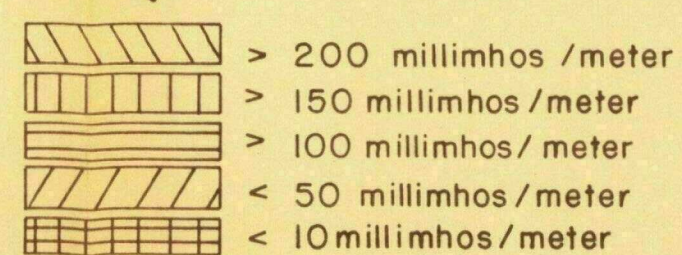
*Please contact the Superfund Records Center to access this information.



Region 10
1200 Sixth Ave.
Seattle, WA 98101



WESTERN PROCESSING REMEDIAL ACTION SITE,
KENT WASHINGTON
PRELIMINARY TERRAIN CONDUCTIVITY MAP
AREA 1 SOUTH (PARTIAL)
PREPARED FOR: HDR INFRASTRUCTURE
PREPARED BY: NORTHERN TECHNICAL SERVICES
PLATE 2 of 2



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